Instructions: Complete each of the following exercises for practice.

1. Determine whether the following statements are true or false in $\mathbb{R}^3$. If false, give an example; if true, explain.
   (a) Two lines parallel to a third line are themselves parallel.
   (b) Two lines perpendicular to a third line are themselves parallel.
   (c) Two planes parallel to a third plane are themselves parallel.
   (d) Two planes perpendicular to a third plane are themselves parallel.
   (e) Two lines parallel to a plane are themselves parallel.
   (f) Two lines perpendicular to a plane are parallel.
   (g) Two planes parallel to a line are themselves parallel.
   (h) Two planes perpendicular to a line are themselves parallel.
   (i) Two planes either intersect or are parallel.
   (j) Two lines either intersect or are parallel.
   (k) A line and a plane either intersect or are parallel.

2. Find vector, parametric, and symmetric equations for the line...
   (a) through points $(1, 1, 2)$ and $(-2, 1, 0)$.
   (b) through $(2, 1, 0)$ and perpendicular to both $\mathbf{i} + \mathbf{j}$ and $\mathbf{j} + \mathbf{k}$.
   (c) through $(-6, 2, 3)$ and parallel to line $\frac{1}{2}x = \frac{1}{3}y = z + 1$.
   (d) of intersection for planes $x + 2y + 3z = 1$ and $x - y + z = 1$.

3. Are the lines L_1 and L_2 below parallel, skew, or intersecting? If intersecting, find their point of intersection.
   (a) $L_1 : \langle 3, 4, 1\rangle + t\langle 2, -1, 3\rangle$; $L_2 : \langle 1, 3, 4\rangle + t\langle 4, -2, 5\rangle$
   (b) $L_1 : x = 5 - 12t, y = 3 + 9t, z = 1 - 3t$; $L_2 : x = 3 + 8t, y = -6t, z = 7 + 2t$
   (c) $L_1 : x - 2 = \dfrac{y-3}{-2} = \dfrac{z-1}{-3}$; $L_2 : x - 3 = \dfrac{y+4}{3} = \dfrac{z-2}{-7}$ $L_1 : x = 1 - y = \dfrac{z-2}{3}$; $L_2 : \dfrac{x-2}{2} = \dfrac{y-3}{-2} = \dfrac{z}{7}$

4. Compute an equation of the plane...
   (a) through point $(1, 2, 4)$ and perpendicular to vector $\langle -2, 1, 3\rangle$.
   (b) through point $(2, -5, 1)$ and having normal vector $\langle 1, 4, 1\rangle$.
   (c) through point $(2, 0, 1)$ and perpendicular to line $x = 3t, y = 2 - t, z = 3 + 4t$.
   (d) through point $(1, -1, -1)$ and parallel to plane $5x - y - z = 6$.
   (e) containing line $x = 1 + t, y = 2 - t, z = 4 - 3t$ and parallel to plane $5x + 2y + z = 1$.
   (f) through points $(0, 1, 2)$, $(3, 2, 1)$, and $(1, 1, 2)$.
   (g) through the origin and points $(1, -1, 0)$ and $(1, 0, -1)$.
   (h) through point $(3, 5, -1)$ and containing line $x = 4 - t, y = 2t - 1, z = -3t$.
   (i) through point $(3, 1, 4)$ and containing the line of intersection of planes $x + 2y + 3z = 1$ and $2x - y - z = 2$.
   (j) through points $(0, -2, 5)$ and $(-1, 3, 1)$ and perpendicular to plane $2z = 5x + 4y$.
   (k) through point $(1, 5, 1)$ and perpendicular to planes $2x + y - 2z = 2$ and $x + 3z = 4$.

5. Find the point at which the line $x = 2 - 2t, y = 3t, z = 1 + t$ intersects the plane $x + 2y - z = 7$.

6. Find the angle between the planes $x + y + z = 0$ and $x + 2y + 3z = 1$.

7. Are the given planes parallel, perpendicular, or neither?
   (a) $x + 4y - 3z = 1$; $-3x + 6y + 7z = 0$
   (b) $9x - 3y + 6z = 2$; $2y = 6x + 4z$
   (c) $x + 2y - z = 2$; $2x - 2y + z = 1$
   (d) $x - y + 3z = 1$; $3x + y - z = 2$
   (e) $2x - 3y = z$; $4x = 3 + 6y + 2z$
   (f) $5x + 2y + 3z = 2$; $y = 4x - 6z$

8. Prove the set of points equidistant from points $(x_0, y_0, z_0) \neq (x_1, y_1, z_1)$ forms a plane; compute its equation.